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CURRENT NOTES ON ANTHROPOLOGY. — I.

[*Edited by D. G. Brinton, M.D., LL.D.*]

Evolution of the Human Skull.

DR. PAUL TOPINARD of Paris, whose studies in physical anthropology place him in the front ranks of that science, has summed up in a recent number of *L'Anthropologie* the results of several years' investigations concerning the transformation of the animal into the human skull. He demonstrates that this change is brought about by the gradual development of the brain, and the resulting mechanical pressure on the hard parts adjacent. The pressure exerted by the enlarging hemispheres on the occipital bone is in a direction backwards and downwards, so that what is its superior surface in ordinary mammals becomes the posterior in man, and its posterior face the inferior. The occipital foramen, instead of looking backwards, is in man turned downwards. The increase in size of the anterior lobes of the hemispheres brings about still greater changes in that portion of the cranium. The orbits are pressed from a lateral into a frontal position, the face, instead of being in front and oblique, becomes vertical, and below the frontal lobes; and numerous minor alterations in the anatomy of the parts are necessitated by these changes. It is easy to arrange a perfectly graduated series of skulls illustrating this development from the lowest mammals up to man. Next to him are the monkeys, below these the lemures, and then follow the inferior mammals. Everywhere the principle of harmonic accommodation of organ to function is strikingly shown. Although the general statement of this evolution has been frequently advanced, it has never before received so complete a demonstration.

Physical Types in the Natives of South America.

The effort has repeatedly been made to subdivide the native tribes of South America on purely physical characters. It was attempted more than fifty years ago by Alcide D'Orbigny, in his "L'Homme Americain;" but his plan has not proved satisfactory. The latest scheme is that of Dr. Deniker, who accompanied the French scientific expedition to Cape Horn. He measured some eighty odd Yahgans, a tribe who live on the southern shore of Tierra del Fuego. He found them of short stature, head large and mesocephalic, prominent superciliary ridges and malar bones, forehead narrow, low, and retreating, eyes small and horizontal, orbits medium, mouth large, lips thick, slight prognathism. On the strength of these measurements, Dr. Deniker has urged in various scientific publications that we find in the Yahgans a "race" quite different from the Patagonians and allied to the Botocudos, the Coroados, and the Aymaras, as well as to the ancient Lagoa Santa peoples. This grouping, allowing that it is anatomically accurate, serves to illustrate how useless is an ethnographic classification based on small anatomical points. The Aymaras, Botocudos and Yahgans are as far apart in language, culture and character as any tribes which could be selected in South America. Moreover, the Botucudos differ widely among themselves is physical aspects, as Dr. Paul Ehrenreich has abundantly shown. In fine, it is high time to dismiss the anatomical subdivisions of the American race, and rely on language as, after all, when prudently employed, our best guide.

Deniker's theories will probably attract the more attention by being brought into relation with the interesting recent discoveries by Florentino Ameghino in the eocene beds of Patagonia. This eminent geologist has described, in a late number of the *Revista Argentina de Historia Natural*, the remains of four species of monkeys from what he believes to be the lower eocene — which would place them far more remote than any found in Eurasia, the oldest there exhumed being from the middle miocene. Ameghino therefore claims Patagonia as the cradle af the first Primates and of the immediate precursors of Man. Nor does he hesitate in this connection to add that in his opinion the very oldest relics of man's activity have been found in the same district.

We must, however, temper this enthusiasm by some hesitancies. When Ameghino assigns these beds to the lower eocene, he does so entirely on palæontologic grounds. The more cautious geologists are getting to rely less and less on these, and to demand more and more stratigraphic testimony. This is alone convincing. The native fauna of Australia to-day is much older in type than that of Eurasia; and similar instances no doubt existed in all ages of the world's history. Moreover, the remains which Ameghino describes are strictly American in type. His *Anthropops perfectus*, although it had its teeth disposed in a semicircle, as in man, had nevertheless thirty-six teeth, as had all the American monkeys, both recent and fossil. His *Homunculus Patagonicus* was yet more Lemurian in type. The evidence is far from adequate, therefore, to substantiate the daring inductions which Ameghino draws from these finds.

The Question of the Celts.

The latest contribution to the vexed question of the ethnographic position of the Celts is from the pen of the veteran anthropologist of Bonn, Professor Schaaffhausen. It is published in the *Festschrift zum Fünfzigjährigen Jubiläum des Vereins von Alterthumsfreunden im Rheinlande.* It includes a careful review of the classical authorities on the Celts and Gauls; in which one is surprised to find a denial that the bands who overran Italy in 393 B.C. were Celtic. Surely the title of their chiefs, *brennus*, "king," is evidence enough that they spoke a Celtic dialect. The professor is also sadly out in attributing the North African blonds to immigration from Europe. The blond type is essentially

that of the Hamitic Berbers who have lived in the vales of the Atlas from the remotest times. In attributing the megalithic monuments of western Europe and northern Africa exclusively to Celtic and Germanic peoples, he proceeds beyond what archæologists have conceded. The difficult problem of the conflicting physical types among the Celtic nations — the one short in stature, brachycephalic, and brown, the other tall, dolichocephalic, and blond — he summarily solves by supposing either an intermixture with other types or a change in mode of life and climatic environment. The Celtic language he places, as do now all leading linguists, within the Aryan group and in that category most closely allied to the Italic stock.

The same topic is discussed very ably by the French anthropologist, Dr. R. Collignon, in one of the recent bulletins of the Société d'Anthropologie. After setting forth in strong lights the embarrassing nature of the evidence, he finally leans to Broca's opinion, that the small, brown, brachycephalic Celts are a mixed type; while the true and primitive type, which we may call the Kymric, was one of tall stature, with reddish or blond hair and dolichocephalic crania. An interesting portion of Dr. Collignon's memoir is where he points out the persistency of various physical types in portions of France for many centuries, even for thousands of years, as an examination of ancient sepulchres has proved.

MOTION AND HEAT.

[Continued from p. 135.]

BUT nature has other means of compensation for the molar motion converted into heat. Incalculable units of heat-energy are stored up in vegetable and animal organisms; and in evaporation still more countless units of heat-energy are converted first into molecular, and then into molar motion, in its most terrific forms.

Evaporation and the function it performs in the economy of nature are as yet little understood. It appears to be a form of expansion, and, like expansion, it increases with elevation of temperature; but it does not stop when expansion ceases, for it is well known that ice continues to evaporate below zero C.

It is undoubtedly the great instrumentality for converting heat into motion. It is constantly acting, and in the trade wind region eleven feet of the ocean's depth is annually lifted up and carried off by this silent process. Molecule by molecule the aqueous vapor is torn from the liquid mass, each one carrying or embodying so much heat and thus reducing temperature; in other words, each molecule moved in evaporation furnishes work in the form of motion for so much of the force or energy which was dynamic in the form of heat.

Molecular motion, evidenced by gaseous expansion in a closed vessel, is governed by the general laws of motion;[1] and it seems incredible and anomalous to hold that the inert molecule moved in evaporation, which unites with its fellows as aqueous vapor, and comes down again as rain, is not governed by the same laws of the motion which this force or energy, in the form of heat, imparts to it in the atmosphere.

If these laws of motion do apply to the motion imparted by converted heat to evaporated molecules, we have an origin for the trade winds far more simple than the generally supposed convection. The trade winds blow over the tropical water where convection is smallest, and not over tropical land, where it is greatest.

But it is sufficient for the present purpose to show that heat is converted into motion in the process of evaporation; and that even if the force or energy which, in the form of molar motion, is directly converted into heat by resistance, cannot be directly reconverted from heat into molar motion, there is in terrestrial nature a law of compensation which tends to convert any surplus of dynamic heat into dynamic motion, and thus preserve the equilibrium which has been observed.

Professor Tyndall has taught us how to trace radiant energy from one body to another, and how the dark or heat rays may be concentrated into the more intense light rays, after they have left the body which sent them forth. And Faraday, Joule, Mayer, Grove, and others have taught us the law of conservation, by which we know that this energy, when it disappears, is not annihilated, and when it reappears it is not a new creation. We see its manifestation in motion, molar and molecular; we feel it in heat, we see it in light and color, and hear it in sound. The motion may cease; light may be extinguished in darkness; colors may fade, and sound give place to profound silence; but the energy or force which caused all these phenomena was the same before they appeared as during their continuance, and its potential existence remains after their disappearance with the same measurable units as when it was dynamic, and subject to observation.

When the demon was cast out of the man and went into the swine, and they ran into the sea, it was the swine, and not the demon, who were drowned. He doubtless passed out into demon land, ready to again become dynamic when occasion offers.

This force, or energy, we are trying to trace, while dynamic, can only do so much work at one time. If it is entirely occupied in moving a mass, it cannot do other mechanical work; and if entirely occupied in molecular motion it cannot elevate temperature, nor become radiant as heat or light. And when rendered entirely potential, as when a ball thrown up is lodged on the roof of a house, or when heat becomes latent in liquefaction or evaporation, or when the sun's energy is locked up in the molecular structure of vegetable and animal organisms, it can do no work at all until again rendered dynamic. Its power and capacity when released is identically the same, neither more nor less, than when it was locked up. This is true whether it was locked up as motion or locked up as heat.

It has always seemed to me to be unfortunate and misleading that Professor Tyndall should have adopted "Heat a Mode of Motion" as the title of the book in which he gives to the world an account of his great and valuable researches in the delimitation of this force. Like the term "Mechanical Equivalent of Heat," it results from mistaking the thing done for the thing doing it, the effect for the cause. Heat is not a mode of motion, and it would be just as inaccurate to call gravity a mode of weight, or magnetism a mode of pull, and even less inaccurate to call motion a mode of heat. Motion and heat are forms or manifestations of the same force or energy, and when radiant, as heat and light, it is more nearly disconnected from ponderable matter than when it assumes the form of molar or molecular motion.

Motion, in all its forms, is the transference of material substance, ponderable or imponderable matter, from one place or part of space to another; it is the state of ponderable matter in which the forces acting on it are not in equi-

[1] "Molecular Motion in the Radiometer," etc., p. 16.